

SyncWare News

The journal for technical
applications of T/S
computers

Volume 3 Number 3

Jan.-Feb. '86

Midwest TS Computerfest

Are you ready! The Timex Computerfest is coming! What started out as the Midwest TS Computer Fair, is turning into the International TS Computer Fair. On May 3rd and 4th, the place to be will be Cincinnati, Ohio. Jack Roberts of the TS Connection and a committee of faithful ZXers have organized a large gathering of hardware and software suppliers, including American and British suppliers, which will converge at the Ramada Inn, Sharondille, Ohio, a suburb of Cincinnati, in early May. There will be new and old products demonstrated from your favorite suppliers and space available for anyone looking to sell second hand software and those unused hardware addons. This should be a good time to confront manufacturers and ask those knowledgeable about interfacing problems that you may have. There will be fun and merriment for all, and we hope to see you there. If you would like to get more information about the computerfest, then contact one of the following people: Jack Roberts, TS Connection, 3822 Watterson Ave., Cincinnati, OH 45227 or Frank Davis, 513 East Main St., Peru, IN 46970, or call (317) 473-4885. If you are a would be vendor, then make contact before March 15, 1986.

QL Submissions Invited

In the last issue, we posed a question about QL support. We received fair response to that question and the vote was unanimous. Everyone did not want QL support in SyncWare News, and many requested to be notified when Q_Review gets started. We received a variety of notes and letters ranging from total enthusiasm to one comparing Sinclair computer purchasers (in the words of P. T. Barnum) to those "suckers born every minute." I should remind that soul that expensive PC's have plenty of interfacing and buggy software problems at 5 times the cost or more. Although the QL is NOT an Amiga, a full blown, equipped QL cost one third or so of a usable Amiga. Check it out for yourself. The same holds for the PC. Try buying software. A QL is comparable in price to a 520ST, but is easily expandable to suit your needs. We are formulating the makeup of the magazine right now and have plans to include product reviews; adding internal memory; the proper use of the Psion packages, SuperBasic and foreign languages, such as, "C" and Pascal; networking and hooking your computers together; and try in general to explain the intricacies and mysteries of the QL, as we have done so for the 1000 and 2068 in this magazine. We invite your submissions as articles or tydbyts to Q_Review. As all good things take time, we expect Q_R to blossom fully as we unravel all of the mysteries that possess this new "black box."

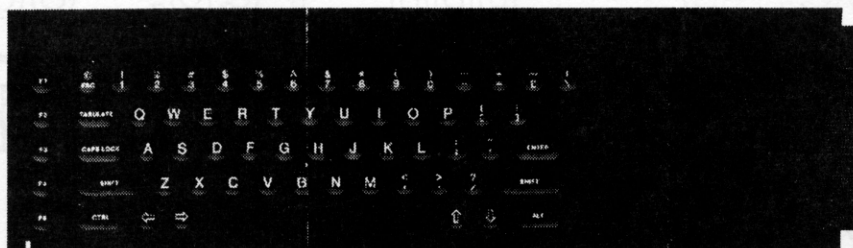
New Updates

Computer Updates appears from the shadow of Pro/File Updates. With the feeling that it was simply impossible to improve on ZX Pro/File anymore, Pro/File Updates has become Computer Updates and will now include updating all of the software that is available from Tom Woods. It will provide applications and tips for software and hardware combinations. This 12 page quarterly magazine is available \$12.95 from Tom Woods, PO Box 64, Jefferson, NH 03583.

THE REVOLUTION CONTINUES

THE SINCLAIR QL ARRIVES!

People are already starting to find out about this remarkable new computer from Sinclair, at Foundation Systems, we decided to have a revolution of our own! . . .

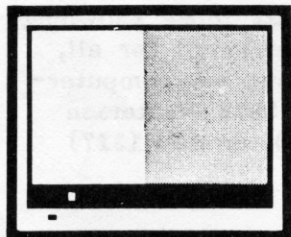


REVOLUTIONARY!

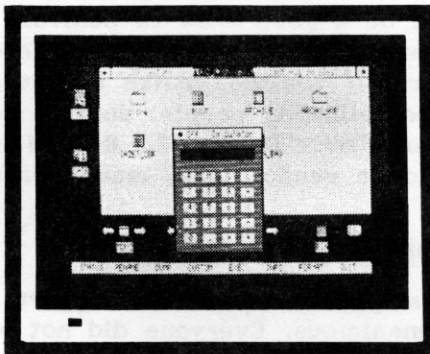
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*Call for pricing on the many software
and hardware packages for the QL.*

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Foundation Systems

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FOR YOUR SUPPORT

Fred Nachbaur (C-12, Mtn. Stn. Group Box, Nelson BC V1L 5P1) has plug-in (no soldering) "M1 NOT adaptors" which allow m/c to run in high memory on most 64K packs, \$14.95. Improved "UPD" (see SWN 2:6) on tape, with manual, for \$14.95. These items also available from E. Arthur Brown Co.... FOURIER (\$18.95) and VDAQ1 (\$12.95) now include HI-RES versions (ZX81/TS1000) at no extra cost.... Available Jan. 20, 1986: °JOBASIC° - (4K) VDP mode 2 Extended BASIC for Oliger video upgrade, 64-columns, hi-res PLOT/DRAW, screen save/load, "safe" syntax, much more. EPROM-able. \$24.95.

Chia-Chi Chao, 73 Sullivan Dr., Moraga, CA 94556, has two Aerco Disc conversion programs for Mscript and Omnicalc (ver. 64000) which are available on cassette or 5 1/4" disc for \$9.00 ea. ppd.

Newpower Inc., 64 Foundry St., Keene, NH 03431, 800 543 8000 (operator 863), has the Sinclair C5 electric vehicle available for \$595.00 built or \$395.00 as a kit plus \$95.00 shipping. Write for more information.

SAF User Group, 2749 Eden Rd., Leslie, MI 49251, 517 589-5542 (evenings) has a 12 Mbyte database of Sinclair information available to members only. This not for profit group will supply abstracts by subject or author @ \$0.03/page (program listings are complete). They also have revised technical manuals for the 2068 and the 1000/1500. These are 300 page manuals and available for \$16.00 ea. A membership @ \$20.00 includes one manual or \$30.00 for both. Contact Robert Dodge.

Ed Grey, PO Box 2186, Inglewood, CA 90305, 213 516 6648, has the Timex 2050 modem available for \$25.00 with quantity discounts. These are new modems, but are not cased and need a power supply.

Samson Okoloko, 4764 Washtensaw Ave. #B3, Ann Arbor, MI 48104, 313 434 0413, has developed 3 structural analysis programs for the 2068/Spectrum. Truss and Grid are available for \$40.00 ea., and Frame is available for \$50.00 and each comes with documentation.

Tom Woods, PO Box 64, Jefferson, NH 03583, 603 586 7734, has Pseudoscope program for the 2068 that will plot input from an external signal for \$16.95 and a Morse Code Translator program that can send, receive and translate short wave radio broadcasts for \$16.95. One of the above is free with his I/O port (see SWN 3/2 support).

G. Russell Electronics, RD1 Box 539, Centre Hall, PA 16828, 814 364 1325, has a Q_Pressor that combines 3 electronic surge suppressors and an I/F filter that is able to truly clamp power line surges in the nano-second time frame. This device is designed for the surge sensitive QL, but is good for all solid state electronic components. It is available for \$18.95.

Steve Wyatt, PO Box 6239, Washington DC 20015, 301 779 7743, has a Spectrum Emulator & Kempston compatible joystick on one board, fully decoded that goes on the expansion port at the back of the 2068 for \$29.95 ppd.

Allan Wolach, Dept. of Psychology, Ill. Institute of Technology, Chicago, IL 60616, 312 536 7661 has a 167 page book describing eleven statistical (ANOVA) programs for the 1000 for \$3.50 ppd. The programs are available on cassette for \$10.00.

Don Dailey, 40 Aspen, Great Falls, MT 59405, has a modified operating system for the 1000 that has the Byte-Back Parallel interface routines written over the 2040 printer routines. It is available for \$20.00 ppd.

Time Designs, 29722 Hult Rd., Colton, OR 97017, has a revised and re-edited 2068 Technical Manual available for \$25.00. They have purchased the rest of Dillithium Press' stock of Timex related books. There are some 1000 books left. Write for details.

C. W. Associates, 419 N. Johnson St., Ada, OH 45810, has the QL available for \$249.95 and the Flat Screen TV for \$84.95. QL software at comparable savings. Send SASE for details.

Robert Fischer, 221 Scoggins St., Summerville, GA 30747, has the first two issues of Extensions, a newsletter to enhance Pro/File 2068, include over 2 dozen enhancements and are available for \$6.00 ea. The third issue, when combined with the first two, will make Pro/File Spectrum Compatible.

Paul Bingham, Pleasantrees Programming, PO Box 7345, Mesa, AZ 85206, announces the return of the book, "Graphics A to Z," for the 1000 with and without the Memotech HRG hardware. The price is \$25.00 ppd.

WOW! AT LAST!! A VERY AFFORDABLE COMPUTER AT A VERY AFFORDABLE PRICE

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See September 1984 issue of 73 for TIMEX/RTTY article

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4134	\$ 9 FOR \$12.85
XR 2211	(SPECIAL) \$ 2.95
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FORUM

The Timex Sinclair Amateur Radio User Group (TSARUG) has organized a FIDO Network node to serve the members of the organization and others who are interested. Messages can be sent to network 15 node 1006 (15/1006). The bulletin board can be accessed directly at (505) 646-5194. Files available include early copies of articles to appear in QZX, the group newsletter. For more information, contact Alex Burr, K5XY, 2025 O'Donnell, Las Cruces, NM 88001.

Dear Editor, In response to Pete Kelly, in SWN 3/2 Forum, you are probably right about the battery powered daisy wheel, but that does not mean that you can't get a battery powered letter quality printer. My Brother EP44 has a 18x24 dot matrix (example of character set in text of the letter) and can be powered by a 6 volt source. Although its RS232 levels are not quite standard, it has been highly touted.

Bob Howard, 750 N. Yaletton Ave., West Covina, CA

The EP44 has a NEAR letter quality character set and NOT letter quality. This text is letter quality (it looks much better before the printer gets hold of it). However, I very much enjoy reading your letters in newsletters that reduce the text to even smaller proportions than what SWN does. The large character of the EP44 is just about only legible thing in some of their issues. Although I personally think that the EP44 has a better character set than the Pro-writer, Gemini 10X (I own one) and Olivetti Ink Jet, it is still a personal choice as to what looks good (some people prefer good cooking to good looks). If I say anymore about this I will surely hang myself on my words. So again, I will leave the rest to this discussion to the philosophers.

Dear Editor, The SWN 3/2, 2068 Curve Tracing program has a misprint in it. Line 1015 says GOTO 1200, but there is no line 1200. Could you explain this and offer a correction?

Richard Norek, 188 St. Felix Ave., Cheektowaga, NY

You correctly cite line 1015 GOTO 1200, which is a line that does not exist. However, the error, if error there be, is one of style, rather than of substance. The elegance of the program is affected by this quirk, but the effectiveness is not. Try the following on any Sinclair computer:

```
10 GO TO 25
20 PRINT 20
30 PRINT 30
40 PRINT 40
```

Although some BASIC dialects will not allow this program to run, Sinclair BASIC will. There is no sacrifice of speed for not having the exact line number in Sinclairese. As often happens, this program included, when a program is modified or improved upon, empty lines are used for improvements followed by the deletion of obsolete lines. -Basil

We have received several letters in past months complaining about products and software from various distributors. The complaints in general are not because the goods were never received, but because for one reason or another, they did not work. For those

with software problems, the difficulty lies in their inability to load the software properly in almost every instance. The incompatibility problem is usually the cassette player. SWN issues, 2/3 and 2/5, show the solutions to these problems.

The other prickly thorn is hardware purchases that either don't function or don't work the way they were first envisioned. The latter quirk is the cause of all the computer disenchantment of recent years.

Computers do not make many jobs easier--initially. The payoff comes after a lot of hard work training (programming) the computer to do its task. Whether your computer is a 1000 or a PC, you use stringy floppy or hard disk, Vu-calc or Lotus 1-2-3, you have a lot of work ahead of you. Learning how to use new hardware and converting software can be as difficult as any task that you set out to do. Take your time and have fun LEARNING. If you are having trouble, then it is a good guess that everyone else is too. Quite often the problem is a very small oversight or an insecure feeling about how you are progressing. My advice for this is, "Join a User Group." Talk with others facing the same problems, gain confidence, divide the problem into handleable tasks and conquer it. If you would like a list of User Groups in your area, then send me a SASE at 9016 Flicker Place, Columbia, MD 21045, and I'll return it promptly.

If you receive equipment that does not work or ceases to work, then remember that you do have a warranty, in spite of the fact that the device is for a Sinclair computer. Communicate your problem directly to the place of purchase. Eventhough your purchase is mail order, you are not deserted. Warranty problems can be rectified very quickly.

If you continue to have problems, then drop us a line stating the problem and what you have done to find a solution. The last thing to do, and something I hope never to see again, is send a hate letter to ever magazine, newsletter and user group crying wolf. We need all of the support that we can get for our computers. Get to know your distributor if possible. One short, friendly phone call can answer a lot of questions and solve a great many problems.

Another problem is one of incompatibility between your software and hardware. This is where SWN comes in. The 1000 is much easier to interface and adapt software to than the 2068. A good disassembler and an extra decode chip can solve virtually any incompatibility problem. Oh yes, add a little time. The 2068 is slightly harder to customize, in that some suppliers will not supply information to patch or

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improve or otherwise modify (see SWN 3/2, pg. 6) their products. Keep hounding them and they will give in.

Another type of question that we receive is that asking for more explicit instructions in the "How to" of a project. They add, "I had to read that article several times." My response is "Join the crowd." I have to read those same articles several times too. Knowledge is not free; you have to work for it. If you read a school text book once, and then ace every test from that book, I'd say that you, well, didn't send me a letter like this. These letters don't say that the project could not be done or had a bug, mind you. Just keep SWN by your side and refer to it often. We'll try to keep it clear.

We have received many letters asking what happened to the CIDS series. We will make every effort to insure the return of CIDS, the database implementation in the next issue.

Calling All Hackers!

We have also received several letters from people looking for patches for Mterm and Spectrum, A&J microdrive and the Spectrum, Psion Vu programs on disk, etc. If you have come up with conversion solutions, send them in or request a FOR YOUR SUPPORT entry. Let everyone know. SWN pays for your work.

! OFF THE WALL

Fred Nachbaur

After hearing about the fantastic prizes we gave out in our last GIANT CONTEST, some distributors and programmers were heard to grumble about the ease in which certain individuals walked off with these Amazing Devices and Miracle Programs. Their collective complaints might be summarized by the following (expletives deleted!)

PRODUCTS FOR NUTHIN'
(with apologies to Dire Straits)

(I want my... I want my SyncWare News)

Look at them yo-yo's, that's the way you do it!
Writin' software for the "SyncWare Three."
That ain't workin', that's the way you do it,
Get your programs for nuthin, and the tapes for free!

No, that ain't working; that's the way you do it.
Let me tell ya, them guys ain't dumb.
Maybe get a callous on your keyboard finger,
Maybe get a callous on your thumb.

We gotta install Microdrive systems,
Custom software deliveries.
We gotta move these Aerco Disk Drives,
We gotta move these AROS Hot-Z's.

That little hacker with the teakwood on his keyboard,
Yeah, buddy, that's him in his lair.
That little hacker got his own twin disc-drives,
That little hacker got a new Sinclair!

We got to solder micro-chip sockets,
Custom EPROM deliveries.
We got to move these "Z-EXTRICATORS",
We got to move these "HORACE WITH SKIS!"

(Look at that! Look at that!)

I shoulda learned to compile that BASIC,
I shoulda written some zappers and guns.
Look at that QL, he's got it stickin' in the phone line...
Yeah we could have some....

Tell ya somethin'... what's that, what's that, synthetic voices?
Bangin' clangin' screamin' like a wild banshee!
Oh, that ain't workin', that's the way to do it.
Get your circuits for nuthin' and your chips for free!

We gotta sell these Microdrive wafers,
Custom keyboard deliveries,
We gotta move these Volume 1 Syncwares,
We gotta move these overlay keys.

Listen, now; that's the way you do it.
You write some software for the "SyncWare Three."
That ain't working, that's the way you do it,
Get your products for nuthin', and your chips for free!

(I want my... I want my SyncWare News!
I want my... I want my SyncWare News)

The SyncWare News

Thomas B. Woods	Publisher
Thomas J. Bent	Editor
Fred A. Nachbaur	Technical Director

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Jefferson, NH 03583
(603) 586 7734

Article submissions, Forum, Support listings, Classified ads and easy questions, should be addressed to:

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(301) 730 7187

Article submissions, issue tapes (when warranted), hardware and related tough questions should be addressed to:

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Back issues of SWN are available for \$3.50 each.
Volume #1 (for the 1000) is available for \$16.95.

SWN is done entirely on TS computers. Submissions are preferred as word processed text files (so we need not re-invent your article) on good tape. Memotext for the 1000 and 1500 and Mscript for the 2068 are preferred word processors. Documents submitted in Tasword Two and other word processors must be done in 52 column format. If you do not have a word processor, but you still have a good idea, then don't hesitate to work it up and submit it. SWN pays authors about \$40.00 per page for original articles. This amount will vary slightly from issue to issue and is paid when the article is published. Write for more information.

Tri-Base Arithmetic

by P.H. Skipper

This program turns your TS1000 into a multi-base arithmetic calculator and number converter. It was written for the TS1000 so it could be used while you write another program on the TS2068. Used in this way, "ARITH" proves to be very useful as a programmers tool. You can also use the program by itself as an instructive aid for understanding what happens in binary or hex arithmetic and logic operations.

"ARITH" lets you input either binary (base 2), decimal (base 10), or hexadecimal (base 16) numbers. The results of the calculation will be displayed in all three number systems. However, inside the program, all values are converted to their decimal equivalent. Almost all calculations are done in decimal, and the results re-converted to binary and hex for the display.

To use "ARITH", enter Listing 1 and RUN it. The screen will clear and the computer will wait for you to input a decimal, hex or binary number. Every entry must be preceded with a "D", "H", or a "B" to indicate whether the number is decimal, hex, or binary respectively. Decimal values must be integers and must range between -65536 and +65535. Hex and Binary inputs must be positive numbers, however, they may be converted to negative after they are entered by using the "+/-" function. (ex: To display the negative of H0010, first enter H0010. Then enter "+/-".)

Values are displayed in a single row across the screen; decimal on the left, hexadecimal next in four hexadecimal digits (hexadigits?), then as 16 binary bits on the right. The display shows negative decimal numbers with a minus sign. Negative hex numbers are displayed in 16's compliment form. A hexadecimal "F" is placed before the four hex digits (Actually, there are an infinite number of "F's" off to the left of such a number. All but the first is discarded. Negative binary numbers are displayed in 2's compliment form. The 16 bits of a negative binary number are preceded by a "C" as an indicator of "Complimented" (In a manner analogous to the "F" explained for hex numbers, this "C" stands for an infinite number of "1's" to the left of the specified number of bits. "C" is used instead of an extra "1" because it is clearer).

Arithmetic Operators

The customary "+", "-", "*", "/", and "=" functions are available in the program. These symbols are entered alone. After entry, they appear on the far left of the screen between the two rows which display the values to which they apply. The "+/-" (change sign) operator is also available. This serves to give the 2's compliment of a number. Here are a few examples of how to solve decimal/hex/binary problems.

```
To add binary 00100111 to decimal 8192, press:
B00100111 <ENTER>
+ <ENTER>
D8192 <ENTER>
= <ENTER>
```

"ARITH"- TRI-BASE CONVERSIONS
AND ARITHMETIC FOR T/S-1000.

```
10 DIM H$(5)
20 DIM B$(17)
30 LET F$=""
40 LET L=1
50 SLOW
60 INPUT I$
70 FAST
80 IF I$="B" OR I$="SCL" THEN
GOTO 280
90 IF I$(1)="D" THEN GOTO 300
100 IF I$(1)="H" OR I$(1)="B" T
HEN GOTO 400
110 IF I$="V" OR I$="CLS" THEN
CLS
120 IF I$="Z" OR I$="COPY" THEN
COPY
130 LET L=0
140 IF I$="+" OR I$="-" OR I$="
* " OR I$="/" OR I$="AND" OR I$="
OR " OR I$="XOR" THEN GOTO 500
150 LET L=2
160 IF I$="+/-" THEN GOTO 900
170 IF I$="STO" THEN GOTO 1500
180 IF I$="RCL" THEN GOTO 1800
190 LET L=3
200 IF I$="=" THEN GOTO 600
210 IF I$="C" THEN GOTO 1000
220 IF I$="SL" OR I$="SR" THEN
GOTO 1100
230 IF LEN I$<3 THEN GOTO 50
240 IF I$(1 TO 2)="RL" OR I$(1
TO 2)="RR" THEN GOTO 1200
250 GOTO 50
260 SCROLL
270 GOTO 50
300 LET D=VAL I$(2 TO )
310 GOTO 2000
400 LET B=2+(14 AND I$(1)="H")
410 LET D=0
420 FOR I=2 TO LEN I$
430 LET D=B*D+CODE I$(I)-28
440 NEXT I
450 GOTO 2000
500 LPRINT I$
510 PRINT I$
520 GOSUB 700
530 LET F$=I$
540 LET L$=D$
550 GOTO 50
600 GOSUB 700
610 LET D=X
620 GOTO 1900
700 IF F$="" THEN LET X=D
710 IF F$="+" THEN LET X=X+D
720 IF F$="-" THEN LET X=X-D
730 IF F$="*" THEN LET X=X*D
740 IF F$="/" THEN LET X=INT (X
/D)
750 IF F$<>"AND" AND F$<>"OR" A
ND F$<>"XOR" THEN RETURN
800 LET D=0
810 FOR I=2 TO 17
820 IF F$="AND" THEN LET D=2*D+
(VAL B$(I) AND VAL L$(I))
830 IF F$="OR" THEN LET D=2*D+(
VAL B$(I) OR VAL L$(I))
840 IF F$="XOR" THEN LET D=2*D+
((VAL B$(I) OR VAL L$(I)) AND NO
T (VAL B$(I) AND VAL L$(I)))
850 NEXT I
860 LET X=D
870 RETURN
900 LET D=-D
910 GOTO 1900
1000 LET I$="1-COMPL"
1010 LET D=-D-1
1020 GOTO 1900
1100 LET D=(2*D AND I$(2)="L")+
INT (D/2) AND I$(2)="R")
1110 GOTO 1900
1200 LET B=VAL I$(3 TO )
1210 IF B>15 OR B<1 THEN GOTO 50
1220 LET C=1
1230 FOR I=2 TO 17-B
1240 LET B$(I)="0"
1250 NEXT I
1260 LET D=0
1270 FOR I=2 TO 17
```


Pressing ENTER after the "=" produces the result in decimal, hex, and binary.

To subtract decimal 400 from hex FDD8, press
 HFDD8 <ENTER>
 = <ENTER>
 D400 <ENTER>
 = <ENTER>

The correct answer in decimal, hex, and binary will be given.

Logical Operators

Besides the arithmetic operators just shown, you also have the logical operators, AND, OR and XOR. Additionally, "C" gives the 1's compliment of a number. These operators are entered in the same way as arithmetic operators:

To logically AND binary 10101010 with decimal 465, press:

D465 <ENTER>
 AND <ENTER>
 B10101010 <ENTER>
 = <ENTER>

The result of the operation will be displayed. Observing the binary outputs of logical functions shows very graphically exactly what happens when AND, OR or XOR is applied to two numbers.

Chaining Operations

Either arithmetic or logic operations may be chained (A+B+C-D). However, there is no hierarchy among operators and no facilities are provided for parentheses. There is a single memory available to help with slightly complex calculations. This memory is accessed by entering the commands "STO" which stores the last number displayed and "RCL" which puts the contents of the memory onto the display.

Shift & Rotate

Binary numbers may be shifted left or right by entering "SR" and "SL". All 16 bits of the number will shift and the corresponding decimal and hex numbers will change accordingly.

Binary numbers can also have their bits rotated. Do this by entering the command "RRn" or "RLn" where "n" specifies the number of bits to rotate. It is necessary to include the number of bits to provide flexibility in rotating eight-bit numbers in the same way that the Z80 microprocessor does. If, for example, n=8, the left most eight bits will be set to zero and the rotation will occur using only the right most bits of the original number. This simulates the RLC x and RRC x (Rotate Left Circular and Rotate Right Circular) instructions of the Z80 except that no carry flag is set or reset. If n=9, the RL x and RR x instructions can be simulated with bit 8 (the ninth bit from the right) being used as the Carry flag.

Screen Control

As numbers and calculations are displayed, the screen slowly fills. Eventually, after the 22nd line is printed, an error 5 (Screen Full) will appear. Entering CONTINUE at this point will clear the screen and start the display at the top again. Two

```

1280 LET D=2*D+VAL B$(I)
1290 NEXT I
1300 IF I$(2)="R" THEN GOTO 1350
1310 IF D<2*(B-1) THEN LET C=0
1320 LET D=2*D+C
1330 IF D>2*B THEN LET D=D-2*B
1340 GOTO 1900
1350 IF D/2=INT (D/2) THEN LET C
=0
1360 LET D=INT (D/2)+C*2*(B-1)
1370 GOTO 1900
1500 LPRINT "STO"
1510 PRINT "STO"
1520 LET S=D
1530 GOTO 40
1600 LET D=S
1610 GOTO 1900
1900 LPRINT I$
1910 PRINT I$
2000 IF D<65536 AND D>-65537 THE
N GOTO 2050
2010 LPRINT "OVERFLOW"
2020 LPRINT
2030 PRINT "OVERFLOW"
2040 PRINT
2050 GOTO 30
2060 IF D<0 THEN GOTO 2200
2100 LET H=D
2110 LET H$(1)=" "
2120 GOSUB 2800
2130 LET B=D
2140 LET B$(1)=" "
2150 GOSUB 2900
2160 GOTO 3000
2200 LET H=65536+D
2210 LET H$(1)="F"
2220 GOSUB 2800
2230 LET B=65536+D
2240 LET B$(1)="C"
2250 GOSUB 2900
2260 GOTO 3000
2800 FOR I=5 TO 2 STEP -1
2810 LET H$(I)=CHR$ (28+H-16*INT
(H/16))
2820 LET H=INT (H/16)
2830 NEXT I
2840 RETURN
2900 FOR I=17 TO 2 STEP -1
2910 LET B$(I)=CHR$ (28+B-2*INT
(B/2))
2920 LET B=INT (B/2)
2930 NEXT I
2940 RETURN
3000 IF L=1 THEN LPRINT
3010 IF L=1 THEN PRINT
3020 LET T=6-LEN STR$ D
3030 LPRINT TAB T;D;TAB 8;H$;TAB
15;B$
3040 PRINT TAB T;D;TAB 8;H$;TAB
15;B$
3050 IF L=0 THEN GOTO 50
3060 IF L=2 THEN GOTO 40
3070 GOTO 30
9900 CLEAR
9910 SAVE "ARIT"
9920 RUN

```

other commands, SCL and "B" will scroll the screen upwards. This will preserve previous numbers of the display which is nice if you want to compare before and after effects of the shift-rotate, or logic operators. The screen can be cleared any time by entering CLS or "V".

Hard Copy

If the 2040 printer is connected and switched on, all information printed to the screen will also be printed on the 2040. This can be stopped by switching off the printer. The entire screen can be copied by entering either COPY or "Z" (the COPY key).

Errors

It is possible to crash this program because there are only a few error traps. However, a crash is not normally a serious problem. The program can just be restarted with "RUN". The following error traps DO exist:

Incorrect entries--The program looks for one of the acceptable entries, and if it is not found, the input is ignored and the cursor is again displayed at the bottom of the screen.

Display overflow--If a result exceeds the maximum which can be displayed (-65537 to +65536) the word "OVERFLOW" will appear instead of the actual number. The number itself will not be lost, and further calculations can be performed on it.

Bits to rotate--The number "n" in the rotate operations is constrained to lie between 1 and 16 inclusive. If it falls outside this range, the entry will be rejected.

Conversion to 2068

For those who wish to use this arithmetic program on the 2068, you can load the listing into the computer either by using the UPLOAD 2000 program or by typing it in by hand.

Delete lines 50, 70, 80, 260, 270, 9910, and 9920 because the TS2068 has no FAST, SLOW, or SCROLL commands, and uses a different system for auto-run.

Finally, change these lines to read as indicated:

```
10 BORDER 0: PAPER 0: INK 6: CLS
20 POKE 23658,8: DIM H$(5): DIM B$(17)
430 LET D=B+D+CODE I$(I)-48-(7 AND CODE I$(I)>57)
1000 LET I$="1's Compl"
1310 IF D<2^(B-1) THEN LET C=0
1330 IF D>2^B THEN LET D=D-2^B
1360 LET D=INT (D/2)+C*2^(B-1)
2610 LET H$(I)=CHR$(H-16*INT (H/16)+48+(7
AND (H-16*INT (H/16)>9)))
2910 LET B$(I)=CHR$(B-2*INT (B/2)+48)
9900 CLEAR: SAVE "arith" LINE 1
```

2068 LOTTO

Carlos Lytle
1064 Worthington Woods
Worthington, OH 43085

This listing was submitted for the contest. Since all of the programs for the contest were judged appropriately, We tried this one on the Maryland Lottery. We lost, therefore this entry lost also.

However, this program will do a good job helping you to lose as well. The benefits that you can derive from letting the computer (especially your Timex) pick your numbers are that you can then blame your losses on Sinclair for developing, Timex for distributing, SWN for printing, Carlos for creating, your computer for lying and the dog for being underfoot as you watch the numbers being drawn on the tube.

In fact, you'll feel so good after all of this buck passing that I'd bet money that you'll use this program again next week!!

```
10 BORDER 5: INK 9: PAPER 0: C
LS
20 PRINT AT 1,8: "Lottery 50:WB
a: TAB 8: "LOTTERY
B 8: "a: TAB 8: "
MAR. 20, 1985 " TAB 8: "
a:
30 PRINT AT 8,6: "1. LOTTO"; AT
10,6: "2. PICK FOUR"; AT 12,6: "3.
THE DAILY NUMBER"
40 PRINT AT 21,7: BRIGHT 0: "En
ter your choice"
50 PAUSE 0: LET J=VAL INKEY$:
IF J<1 OR J>3 THEN GO TO 50
60 CLS: BORDER J: GO TO 1000*
1000 PRINT INK 7: PAPER 0: AT 0,1
0: "
1010 PRINT: RESTORE
1020 LET b1=0
1030 FOR c=1 TO 5: READ a$
1040 DATA "A","B","C","D","E","F
"G","H","J","K"
1050 PRINT TAB 10: "Section No.:"
a$
1060 FOR a=1 TO 6
1070 LET b=INT (AND*40)+1
1080 IF b=b1 THEN GO TO 1070
1100 IF b<10 THEN PRINT " ";
1110 PRINT " ";b;
1120 LET b1=b: NEXT a
1130 PRINT TAB 3: "-----"
```

```
1140 PRINT
1150 NEXT c
1160 INPUT "C=Copy R=Reset
=Next "; LINE d$: IF d$="c"
THEN COPY
1170 IF d$="r" THEN CLS: GO TO
1000
1180 IF c=6 THEN CLS: PRINT "
FOR c=6 TO 10: READ a$: GO TO 1
050
1190 PRINT TAB 6: INK 2: PAPER 7
: FLASH 1: " G O O D L U C K "
1200 PAUSE 200: GO TO 10
2000 PRINT AT 6,7: "PICK FOUR
a:
2010 FOR c=1 TO 4
2020 LET p4=INT (AND*10)
2030 PRINT AT 12,8+(c*3): p4
2040 NEXT c
2050 PRINT AT 21,7: "Push "; FLA
SH 1: p4: FLASH 0: " for MENU "
2060 IF INKEY$<>STR$ p4 THEN GO
TO 2060
2070 GO TO 10
3000 PRINT AT 6,6: "THE NUM
BER"
3010 FOR c=1 TO 3
3020 LET p3=INT (AND*10)
3030 PRINT AT 12,10+(c*3): p3
3040 NEXT c
3050 PRINT AT 21,7: BRIGHT 1: " P
ush "; FLASH 1: p3: FLASH 0: " for
MENU "
3060 IF INKEY$<>STR$ p3 THEN GO
TO 3060
3070 GO TO 10
```

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2068 Review CHECKREC & INVENTORY

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"CHECKREC 2000" and "HOUSEHOLD INVENTORY 2000" are both written entirely in BASIC, in spread-sheet format. Their best features are the scrolling facilities used in viewing their respective lists. The cursor keys are used to move the 10-line by 32-column window. They both work fast enough for light uses, but slow down rapidly as the file fills up. The printer routines are designed for the TS2040, but can be used on larger printers with the appropriate interface software.

CHECKREC 2000 is a simple checkbook balancer. You have the option of entering checks, deposits, viewing the list, printing, reconciling or saving his checks. The first two options ask for the same information that would be found in the average checkbook register.

When viewing the records, this program keeps a running balance on your account. Corrections can be made from this mode, but there is no way to remove an erroneous entry.

Printer options are to list all transactions, outstanding checks, unposted deposits, and reconciliation summary. The last three of these can hang up the computer and should only be done after saving the data.

Reconciling is done by entering the numbers of the returned checks and the dates of the deposits. You are then led through a series of questions about service and miscellaneous charges, and the final balance on the statement.

The documentation is weak, only one page, and the lack of error traps can be frustrating when the program hangs up after entering 50 checks. CHECKREC can hold up to 200 entries but the last 9 cannot be corrected. Overall, CHECKREC 2000 is sufficient as a low-cost solution for those who need help with balancing their checkbooks.

HOUSEHOLD INVENTORY 2000 is a straight-forward, easy to operate inventory program that will keep pertinent data on up to 300 items. You are given the choice of entering data, viewing the list, printing the list, clearing the spread sheet or saving the list.

There are fields for the item description, date of purchase, serial number, etc. These are correctable from the "view" menu. The printer routine gives hard-copy of the list on the TS2040 printer.

The fourth option will clear the spread-sheet of all records. This is the only type of "delete" function available; there is no way to delete a single entry.

This program makes up for the lack of documentation by having the instructions on the screen at all times. It is good enough for an insurance list, but not flexible enough for other applications.

Reviewed by: Kenneth E. Majors
964 D Pine Ct., NAS Meridian, MS 39305

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UNIVERSAL I/O PORT

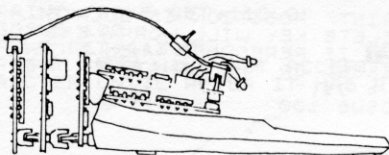
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GET: A STRING INPUT ROUTINE

Shawn A. Byrne

Here is the 2nd-prize winner in the TS1000 category of our DISPLAY CONTEST. Interestingly, we received THREE separate programs that performed a similar function, and choosing between them was a real challenge. GET took the prize for its relocatability, flexibility, and internal documentation.

Use HOT Z or your favorite hex-loader to enter the 295 machine-code bytes into a 1 REM statement. Then add the BASIC listing and save it to tape. You will have a completely self-documenting program on the use of GET.

To INPUT numbers, first GET the number into G\$, then use VAL to change it into floating-point form. To allow decimal points, make the line following the USR GET a "REM ,-9".

The original program required the first six bytes in the first REM statement for its internal variables. We took the liberty of moving these variables into the printer buffer area, making the GET code usable even if you have other machine-code in the 1 REM area (starting at 16514). This buffer is cleared before being used for printer operations, so the change should in no way affect your hard-copy.

GET also uses the "unused" system variables at 16417 and 16507/16508. This latter one is also used by the Aerco disk system, so if you're using the program with the disk you should change references to VAR5 (407B) to 4042 (also in the printer buffer). GET to it!

```

2 REM GET BY SHAWN BYRNE 1983
3 LET GET=16520
4 LET AS=ENTER CONT TO CONTI
NUE 5 STOP TO STOP
100 PRINT AT 20,0:AS
110 LET G$=""
120 PRINT AT 21,12;
130 LET N$=G$ (TO USR GET)
140 IF N$=0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199,200,201,202,203,204,205,206,207,208,209,210,211,212,213,214,215,216,217,218,219,220,221,222,223,224,225,226,227,228,229,230,231,232,233,234,235,236,237,238,239,240,241,242,243,244,245,246,247,248,249,250,251,252,253,254,255,256,257,258,259,260,261,262,263,264,265,266,267,268,269,270,271,272,273,274,275,276,277,278,279,280,281,282,283,284,285,286,287,288,289,290,291,292,293,294,295,296,297,298,299,300,301,302,303,304,305,306,307,308,309,310,311,312,313,314,315,316,317,318,319,320,321,322,323,324,325,326,327,328,329,330,331,332,333,334,335,336,337,338,339,340,341,342,343,344,345,346,347,348,349,350,351,352,353,354,355,356,357,358,359,360,361,362,363,364,365,366,367,368,369,370,371,372,373,374,375,376,377,378,379,380,381,382,383,384,385,386,387,388,389,390,391,392,393,394,395,396,397,398,399,400,401,402,403,404,405,406,407,408,409,410,411,412,413,414,415,416,417,418,419,420,421,422,423,424,425,426,427,428,429,430,431,432,433,434,435,436,437,438,439,440,441,442,443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,459,460,461,462,463,464,465,466,467,468,469,470,471,472,473,474,475,476,477,478,479,480,481,482,483,484,485,486,487,488,489,490,491,492,493,494,495,496,497,498,499,500,501,502,503,504,505,506,507,508,509,510,511,512,513,514,515,516,517,518,519,520,521,522,523,524,525,526,527,528,529,530,531,532,533,534,535,536,537,538,539,540,541,542,543,544,545,546,547,548,549,550,551,552,553,554,555,556,557,558,559,560,561,562,563,564,565,566,567,568,569,570,571,572,573,574,575,576,577,578,579,580,581,582,583,584,585,586,587,588,589,590,591,592,593,594,595,596,597,598,599,600,601,602,603,604,605,606,607,608,609,610,611,612,613,614,615,616,617,618,619,620,621,622,623,624,625,626,627,628,629,630,631,632,633,634,635,636,637,638,639,640,641,642,643,644,645,646,647,648,649,650,651,652,653,654,655,656,657,658,659,660,661,662,663,664,665,666,667,668,669,670,671,672,673,674,675,676,677,678,679,680,681,682,683,684,685,686,687,688,689,690,691,692,693,694,695,696,697,698,699,700,701,702,703,704,705,706,707,708,709,710,711,712,713,714,715,716,717,718,719,720,721,722,723,724,725,726,727,728,729,730,731,732,733,734,735,736,737,738,739,740,741,742,743,744,745,746,747,748,749,750,751,752,753,754,755,756,757,758,759,760,761,762,763,764,765,766,767,768,769,770,771,772,773,774,775,776,777,778,779,780,781,782,783,784,785,786,787,788,789,790,791,792,793,794,795,796,797,798,799,800,801,802,803,804,805,806,807,808,809,810,811,812,813,814,815,816,817,818,819,820,821,822,823,824,825,826,827,828,829,830,831,832,833,834,835,836,837,838,839,840,841,842,843,844,845,846,847,848,849,850,851,852,853,854,855,856,857,858,859,860,861,862,863,864,865,866,867,868,869,870,871,872,873,874,875,876,877,878,879,880,881,882,883,884,885,886,887,888,889,890,891,892,893,894,895,896,897,898,899,900,901,902,903,904,905,906,907,908,909,910,911,912,913,914,915,916,917,918,919,920,921,922,923,924,925,926,927,928,929,930,931,932,933,934,935,936,937,938,939,940,941,942,943,944,945,946,947,948,949,950,951,952,953,954,955,956,957,958,959,960,961,962,963,964,965,966,967,968,969,970,971,972,973,974,975,976,977,978,979,980,981,982,983,984,985,986,987,988,989,990,991,992,993,994,995,996,997,998,999,1000,1001,1002,1003,1004,1005,1006,1007,1008,1009,1010,1011,1012,1013,1014,1015,1016,1017,1018,1019,1020,1021,1022,1023,1024,1025,1026,1027,1028,1029,1030,1031,1032,1033,1034,1035,1036,1037,1038,1039,1040,1041,1042,1043,1044,1045,1046,1047,1048,1049,1050,1051,1052,1053,1054,1055,1056,1057,1058,1059,1060,1061,1062,1063,1064,1065,1066,1067,1068,1069,1070,1071,1072,1073,1074,1075,1076,1077,1078,1079,1080,1081,1082,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1109,1110,1111,1112,1113,1114,1115,1116,1117,1118,1119,1120,1121,1122,1123,1124,1125,1126,1127,1128,1129,1130,1131,1132,1133,1134,1135,1136,1137,1138,1139,1140,1141,1142,1143,1144,1145,1146,1147,1148,1149,1150,1151,1152,1153,1154,1155,1156,1157,1158,1159,1160,1161,1162,1163,1164,1165,1166,1167,1168,1169,1170,1171,1172,1173,1174,1175,1176,1177,1178,1179,1180,1181,1182,1183,1184,1185,1186,1187,1188,1189,1190,1191,1192,1193,1194,1195,1196,1197,1198,1199,1200,1201,1202,1203,1204,1205,1206,1207,1208,1209,1210,1211,1212,1213,1214,1215,1216,1217,1218,1219,1220,12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21,2222,2223,2224,2225,2226,2227,2228,2229,2230,2231,2232,2233,2234,2235,2236,2237,2238,2239,2240,2241,2242,2243,2244,2245,2246,2247,2248,2249,2250,2251,2252,2253,2254,2255,2256,2257,2258,2259,2260,2261,2262,2263,2264,2265,2266,2267,2268,2269,2270,2271,2272,2273,2274,2275,2276,2277,2278,2279,2280,2281,2282,2283,2284,2285,2286,2287,2288,2289,2290,2291,2292,2293,2294,2295,2296,2297,2298,2299,2300,2301,2302,2303,2304,2305,2306,2307,2308,2309,2310,2311,2312,2313,2314,2315,2316,2317,2318,2319,2320,2321,2322,2323,2324,2325,2326,2327,2328,2329,2330,2331,2332,2333,2334,2335,2336,2337,2338,2339,2340,2341,2342,2343,2344,2345,2346,2347,2348,2349,2350,2351,2352,2353,2354,2355,2356,2357,2358,2359,2360,2361,2362,2363,2364,2365,2366,2367,2368,2369,2370,2371,2372,2373,2374,2375,2376,2377,2378,2379,2380,2381,2382,2383,2384,2385,2386,2387,2388,2389,2390,2391,2392,2393,2394,2395,2396,2397,2398,2399,2400,2401,2402,2403,2404,2405,2406,2407,2408,2409,2410,2411,2412,2413,2414,2415,2416,2417,2418,2419,2420,2421,2422,2423,2424,2425,2426,2427,2428,2429,2430,2431,2432,2433,2434,2435,2436,2437,2438,2439,2440,2441,2442,2443,2444,2445,2446,2447,2448,2449,2450,2451,2452,2453,2454,2455,2456,2457,2458,2459,2460,2461,2462,2463,2464,2465,2466,2467,2468,2469,2470,2471,2472,2473,2474,2475,2476,2477,2478,2479,2480,2481,2482,2483,2484,2485,2486,2487,2488,2489,2490,2491,2492,2493,2494,2495,2496,2497,2498,2499,2500,2501,2502,2503,2504,2505,2506,2507,2508,2509,2510,2511,2512,2513,2514,2515,2516,2517,2518,2519,2520,2521,2522,2523,2524,2525,2526,2527,2528,2529,2530,2531,2532,2533,2534,2535,2536,2537,2538,2539,2540,2541,2542,2543,2544,2545,2546,2547,2548,2549,2550,2551,2552,2553,2554,2555,25
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1180 PRINT "IF THE RESPONSE IS N
OT NEEDED ON THE SCREEN, THE PRIN
T POSITION CAN BE MOVED OFFSCRE
EN BY:"
1190 PRINT
1200 PRINT TAB 8;"POKE 16399,0"
1210 PRINT
1220 PRINT "OTHERWISE, THE RESPO
NSE CAN BE POSITIONED ON THE SC
REEN BY:"
1230 PRINT
1240 PRINT TAB 5;"PRINT AT (LINE
),(COL):"
1250 PRINT
1260 PRINT "BEFORE THE ROUTINE I
S CALLED:"
1270 GOSUB 100
1280 PRINT "IMMEDIATELY FOLLOWIN
G THE LINE NUMBER IN WHICH GET
IS CALLED:"
1290 PRINT "THERE MUST BE A REM
LINE WHICH SPECIFIES THE CHARAC
TER(S) WHICH ARE TO BE USED IN TH
E RESPONSE. CHARACTERS MUST BE S
EPARATED BY A COMMA OR A HYPHEN.
1300 PRINT
1310 PRINT "EXAMPLE 1: REM 0-9"
1320 PRINT
1330 PRINT "WILL GIVE A RESPONSE
TO ALL THE NUMBERS FROM 0 THROU
GH 9."
1340 PRINT
1350 PRINT "EXAMPLE 2: REM 2,7,
C,R"
1360 PRINT
1370 PRINT "WILL GIVE A RESPONSE
ONLY TO THOSE CHARACTERS."
1380 GOSUB 100
1390 PRINT "EXAMPLE 3: REM A-F"
1400 PRINT
1410 PRINT "WILL GIVE A RESPONSE
ONLY TO THE LETTERS A THROUGH F.
1420 PRINT
1430 PRINT "EXAMPLE 4: REM 0-Z"
1440 PRINT
1450 PRINT "WILL GIVE A RESPONSE
TO ALL THE NUMBERS (0 THROUGH 9
) AND TO ALL THE LETTERS (A THROU
GH Z)."
1460 GOSUB 100
1470 PRINT "GET HAS A COUNTER WH
ICH CAN BE USED AS A TIMER. AFT
ER GET HAS EXECUTED, THIS COUNT
ER VALUE CAN BE FOUND BY:"
1480 PRINT
1490 PRINT "PEEK 16446+256*PEEK
16447+65536*PEEK 16448"
1500 PRINT
1510 PRINT "A GET EXECUTION TIME
OF 1 MINUTE WILL RESULT IN A COU
NT OF ABOUT 26,770."
1520 PRINT
1530 PRINT "THE EXACT COUNT WILL
VARY WITH EACH COMPUTER AND WI
LL HAVE TO BE DETERMINED BY EXP
ERIMENTING."
1540 GOSUB 100
1550 PRINT "EXAMPLE OF GET COUNT
ER:"
1560 PRINT
1570 PRINT "PLEASE PRESS THE ""Q
"" KEY."
1580 LET G$=""
1590 PRINT AT 5,15;
1600 RAND USR GET
1610 REM Q
1620 PRINT
1630 LET N=INT ((PEEK 16446+256*
PEEK 16447+65536*PEEK 16448)/446
.1657)
1640 PRINT
1650 PRINT TAB 6;"YOUR RESPONSE
TIME WAS "
1660 PRINT
1670 PRINT TAB 10;N;" SECONDS."
1680 GOSUB 100
1690 POKE GET+113,CODE "S"
1700 PRINT "THE FLASHING CURSER
USED ON THE SCREEN CAN BE ANY CH
ARACTER. FOR EXAMPLE, FOR A F
LASHING ""S"":"
1710 PRINT
1720 PRINT "POKE GET+113,CODE ""
S""
1730 PRINT
1740 PRINT "TO RETURN TO THE FLA
SHING SPACE:"
1750 PRINT
1760 PRINT "POKE GET+113,0"
1770 GOSUB 100
1780 POKE GET+113,0
1790 PRINT "GET WILL NOT ACCEPT
A CHARACTER UNTIL AFTER IT HAS R

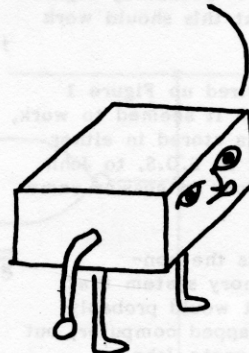
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ECIEVED THE SIGNAL THAT NO KEY I
S BEING PRESSED, SO UPON ENTE
RING GET, IF A KEY IS BEING PRESS
ED, IT WILL NOT BE ACCEPTED UNTI
L THE FINGER IS LIFTED AND A KEY
PRESSED AGAIN."
1800 PRINT "THIS PREVENTS A CHAR
ACTER FROM BEING REPEATED RAPID
LY."
1810 PRINT "TO ALLOW A CHARACTER
TO BE AC-CEPTED ON ENTERING G
ET WHEN IT IS ALREADY BEING PRE
SSED:"
1820 PRINT
1830 PRINT TAB 4;"POKE GET+129,2
4"
1840 PRINT
1850 PRINT "TO RETURN TO NORMAL:"
1860 PRINT
1870 PRINT TAB 4;"POKE GET+129,4
0"
1880 GOSUB 100
1890 PRINT "AN EXAMPLE OF A BASI
C LISTING TO USE GET IS:"
1900 PRINT
1910 PRINT "10 LET GET=16520"
1920 PRINT "100 LET G$=""
1930 PRINT "110 PRINT AT 10,15;"
1940 PRINT "120 LET N$=G$(TO US
R GET)"
1950 PRINT "130 REM N,Y"
1960 PRINT "140 IF N$="" THEN
GOTO 100"
1970 PRINT "150 IF N$=""N"" THEN
GOTO 1000"
1980 PRINT "160 IF N$=""Y"" THEN
GOSUB 60"
1990 PRINT
2000 PRINT "LINE 140 PREVENTS A
RESPONSE TO ENTER."
2010 PRINT "LINES 150 AND 160 DE
TERMINE THE RESPONSE ACTION."
2020 GOSUB 100
2030 PRINT "GET CAN BE USED AS M
ANY TIMES IN A BASIC PROGRAM AS N
EEDED. EACH TIME IT IS USED THE
LENGTH OF THE RESPONSE AND THE
CHARACTERS CAN BE REDEFINED IN
BASIC."
2040 PRINT
2050 PRINT AT 10,10;"SHAWN A. BY
RNE"
2060 PRINT TAB 10;"RT. 3 BOX 34
2"
2070 PRINT TAB 10;"COOKEVILLE, T
N."
2080 PRINT TAB 20;"38501"
2090 PRINT
2100 PRINT TAB 10;"615/526-7914"
2110 GOSUB 100
2120 RUN
9997 STOP
9998 SAVE "GET"
9999 RUN

```

Hey baby, what's
your address.



Mike
Trivisonno

BLOCK MOVES

ONE CHIP MODS

Recycle That 16K Rampack!

John Oliger & Fred Nachbaur

One of the great things about the Sinclair/Timex family of computers is that it is ideally suited for hardware experimentation. This is especially true of the ZX81/TS1000. Still, a lot of folks are hesitant to tear into their precious machines for fear that their experiments will result in the death of the "patient."

So here's a little project that won't even require the removal of the sticky-feet on the bottom of your computer. Do you have a spare Sinclair/Timex 16K RAM pack floating around? If not, you can probably pick one up for a song if you look around a bit. (Check Hal-Tronix' ad in SWN 3:2.) How would you like two banks of 8K memory in the 8-16K range? Well, with a 16K pack and one inexpensive chip you can have just that.

In addition to the RAM pack you'll need a 74LS02 or 74HC02 IC (costs under \$1). Add one 2.7K, 1/4W. resistor, a diode, and a subminiature SPST and you're ready to go.

Theory

If you just want to get on with it, skip this section. But if you want to learn a little about memory decoding on the Sinclair, this section might give some insights.

First I'll tell you how NOT to do it. I thunk up the circuit of Figure 1, using the following logic. A14 controls the 16K "block" of memory; when it is low, the 0-16K (and 32-48K) region is addressed, and when high, the 16-32K (and 48-64K) region is being paged. So the first step would be to invert this A14 signal, so that the RAM pack responds to signals in the 0-16K range instead of 16-32K as normal. Furthermore, the RAM pack's MREQ NOT should be engaged (brought low) only when the 8-16K region is addressed; in other words, only if computer MREQ NOT is low and A13 is high. Lastly, we want to turn off the ROM under these conditions, as the Sinclair/Timex ROM "echoes" in the 8-16K range due to incomplete internal decoding. The RAM pack's disconnected A13 line could then be used to select one of the two available banks. If you study Figure 1, you might think, as I did, that this should work fine.

However, there's a problem. I wired up Figure 1 using a single 74LS00, and though it seemed to work, it occasionally corrupted the data stored in either of the two blocks. Time to send an S.O.S. to John Oliger... and true to his reputation, an answer came a couple weeks later.

The key is that, once again, it is the non-standardness of the Sinclair memory system that causes trouble. The above circuit would probably work with any other similarly mapped computer, but not with the Sinclair/Timex. To quote John,

"Your circuit for the 16K RAM pack is giving you problems because it will interfere with the RAM's refresh. MREQ NOT is tied directly to the memory chips' RAS NOT (Row-Address Strobe) pins through an

OR gate, causing either a real RAS NOT or a RAS-only refresh during refresh time. MREQ NOT is active during a 'window' of the refresh cycle, and the Sinclair pack uses this fact to advantage. So, if A13 is not high from the 'I' register during this time (this is set for the video routines to 1Eh, which would NOT have A13 high), no refresh would be performed during refresh time. The memory would still be partially refreshed from normal READ/WRITE, but would be very erratic and undependable."

"Try the circuit in Figure 2 and see if that fixes the problem. The key in using the Sinclair RAM pack like this is A14. A14 being high can be thought of as the ACTIVE HIGH CHIP SELECT for the RAM pack. Use IT instead of MREQ NOT."

"Another benefit from doing it like this would be the fact that A15 is included in the decoding, and thus the RAM pack will be fully decoded for the 8-16K region, and NOT BE REFLECTED at 40-48K."

If you study Figure 2, you'll see that it accomplishes the same result, but doesn't interfere with MREQ NOT. Note that we're using A15 also (specifies 0-32K or 32-64K). If A14 and A15 are both low, and A13 is high, then ROMCS is inhibited and the RAM is activated (via its A14 line). MORAL: Go ahead and try your hare-brained ideas, they might even work. If they don't - ask an expert.

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FIGURE 1: This circuit DOES NOT work (see text).

The diagram illustrates a circuit intended to generate the signal $\overline{A13} + \overline{MREQ}$ for BANK A/B. The circuit uses two 7401 NAND gates and a 7404 inverter. The inputs are $A13$ and $\overline{MREQ}$. The output of the first NAND gate is labeled $\overline{A14}$ and $\overline{A13}$. The output of the second NAND gate is labeled $\overline{MREQ}$ and $\overline{A13} + \overline{MREQ}$. The circuit is intended to produce the signal $\overline{A13} + \overline{MREQ}$, but the logic is flawed.

First come the mechanics. Open the RAM pack, and find a place to mount the switch where it won't interfere with anything when you close it up later. I super-glued a small "DIP switch" via a small plastic pad to the upper-left corner of the decoder board (the one with the edge connector on it). A square hole in the front case-half allows the switch to protrude and be accessed when the pack is installed. This is the "BANK A/B" switch. You might want to use a magnetic reed switch and magnet (a la "ROMSWITCH") and you won't even have to put any holes in the case. Now cut the traces going to the

If you plan to use this with 2K only (no other external RAM) you'll also have to cut the traces that go between pins 1B and 2A (RAMCS NOT). Note

FIGURE 2: This circuit DOES work. Read text to find out why.

The circuit diagram shows the following components and connections:

- Inputs:** A13, A14, A15, ROMCS (labeled $\overline{\text{ROMCS}}$), and a +5V supply.
- Logic Components:** Two 74LS02 or 74HC02 inverters and three NAND gates.
- Connections:**
 - A13 is connected to the first inverter and the first NAND gate.
 - A14 is connected to the second inverter and the second NAND gate.
 - A15 is connected to the third inverter and the third NAND gate.
 - The output of the first inverter is connected to the first NAND gate.
 - The output of the second inverter is connected to the second NAND gate.
 - The output of the third inverter is connected to the third NAND gate.
 - The output of the first NAND gate is connected to the second NAND gate.
 - The output of the second NAND gate is connected to the third NAND gate.
 - The output of the third NAND gate is connected to the RAM circuitry.
- Labels:** "TO COMPUTER", "cut X", "2.7K", "BANK A/B", "TO RAM CIRCUITRY", "NC to RAMPack", "1N4148", and $\overline{\text{A14}} * \overline{\text{A15}} * \text{A13}$.

that there's a trace on each side of the board; you have to cut both. This is recommended but not vital even if you do use external RAM.

Now do the final wiring. Pin 14 goes to +5V (edge connector 1B) and pins 6, 7, 8 go to ground (4B and 5B). Pin 12 goes to A15 (11B) and pin 11 goes to A14 (12B). Pin 5 goes to A13 (13B). Finally, pin 1 connects to ROMCS NOT (23B) via a 1N914/1N4148 diode, banded end towards ROMCS NOT. Pin 1 ALSO goes straight to the other side of the cut trace to A14.

Finally, wire up your switch between the other side of the cut A13 line and ground. Also connect this trace to +5V through a 2.7K resistor. There! All done!

Now prepare the 74LS02 IC. Bend the legs so they stick straight out from the body of the chip. Bend the narrow parts of pins 3 and 4 toward each other and solder them together. Do the same to pins 6 and 7. Cut off the narrow parts of the remaining pins. Now run a jumper from pins 6 and 7 to pin 8. Run another (insulated) jumper from pin 2 to pin 10. Run a third jumper from pin 9 to pin 13. Route the jumpers over the numbered side (top).

Mount the IC with sticky-foam or silicone glue, on the backside of the decoder board, between the 74LS157 and the high-numbered end of the edge-connector. Position it carefully, there isn't much room here (that's why we trimmed off the excess pin length).

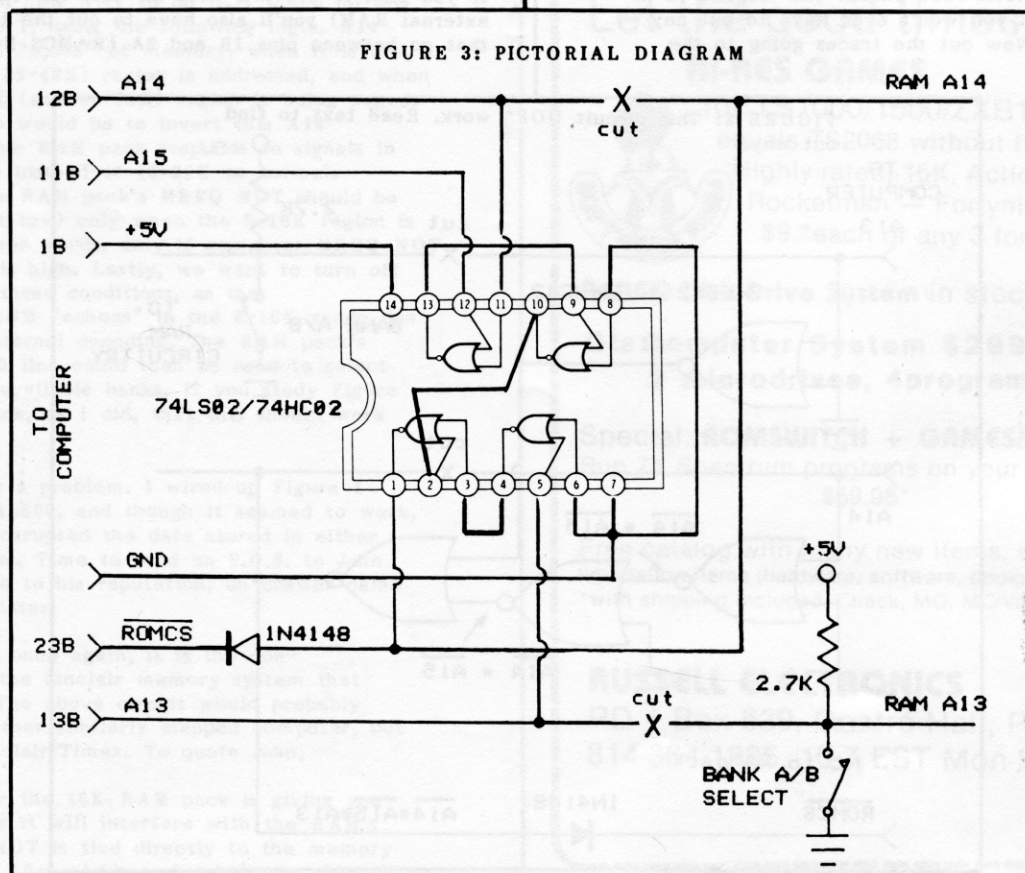
Test For Smoke

To test it, you'll have to install it as the last thing in your line-up (obviously, since it doesn't have a through-connector). If your main RAM is another Timex or Sinclair pack, you could add a finger board, but it's tricky and you won't be able to get it back in the case. Better to use another pack, that already has a finger board through-connector. Alternately, make up a "mother board" or extension cable to plug everything into.

Check everything over, then check it again. Use the pictorial diagram of Figure 3 as a guide. If all looks good, power 'er up, and try POKing values into the range from 8192 to 16383, and then PEEKing to see if you get the same values back. Then flip the bank switch, and do the same with the other bank.

If all went well so far, put it all back into the case and test it again. You're now ready to run machine-code in this region, or simply use it to store often-used programs. I've successfully stored and run Memotext in one bank, with the Delphic 4K toolkit, Z-XLR8, UPD and a few other utilities in the other bank. Toggling the switch won't corrupt memory or crash the machine provided you're not addressing (reading from or writing to) this region at the time. In other words, flip the switch only when you're back in BASIC.

There. Wasn't that fun? As a final note, this doesn't work with my TS1500. If any of you wizards out there can figure out why, I'd love to hear from you.



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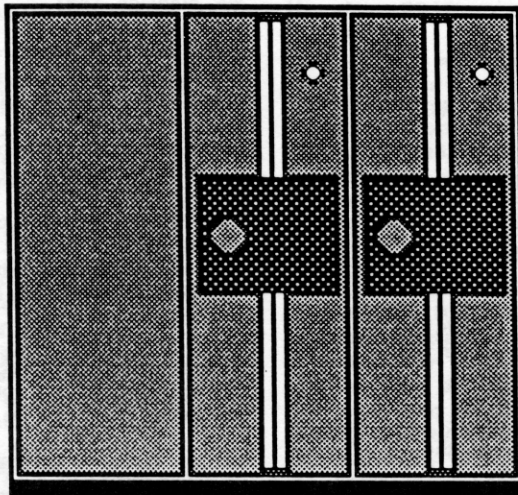
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A Few NO-NOs

This chapter will explain the three instructions that it would be wise to avoid in ZX81 machine coding. In decreasing order of importance, they are 118, 126, and sometimes 11. But first to our little digression.

The bad news is that I don't have any "fun" program for you this time. The good news is that I'm going to suggest a little technique that will help you to keep track of the ones that you already have.

Figure 7-1 gives you an idea of how all those utility programs can be stacked up into a series. Leave Line 1 vacant for the moment, and enter all your utility routines as shown in lines 100, 110, 120, etc. If you want, use line numbers 1000, 1100, etc., or any other numbers--but it's most convenient to use line numbers beginning with the digit "1" (for reasons that will soon become apparent).

Line 10 gives an index to the series. This is optional, as are the "operating instructions" that are interpolated between the successive machine code routines. Now, when you want to invoke a machine code routine, just bring the selected routine down into the EDIT position, and put it into position as line number 1. (Which is easier to do if the line number already begins with 1.) And there you are, ready to go.

You'll also notice that I added the name of each machine code line at the end of the routine. This is completely kosher--once the computer has encountered and complied with the RETURN instruction, it doesn't matter what additional garbage (or other verbiage) is included.

And now back to the lesson.

Before going through the next steps, SAVE any material in the computer that you may want to keep.

Now, suppose you want to LET BC=118. Or, in machine code jargon, Load BC with 118. Use the loader program we introduced last time, making sure that you have enough nulls, and enter Line 100 as

```
100 LET P$="6.0.14.118.201."
```

and RUN. You'll notice that the program proofreads perfectly all right, and that PRINT USR 16514 gives 118, just as you expected. Now LIST the program, and bring line 1 down into the EDIT position. Where'd everybody go?!!!

Just to make sure how much we lost, PRINT USR 16514 again. Well, at least that much still works. Now LIST 10. There's the rest of the program, so I guess we haven't done anything fatal. Let's change the program to

```
100 LET P$="14.118.6.0.201."
```

and RUN. Again the proofread is OK. PRINT USR 16514, and you'll see that it doesn't matter whether we

load B or C first, as long as we're telling the computer separately what to put into each byte. But pay attention to that "as long as" proviso. When we get around to loading both registers with a single command, it's going to matter very much which one we mention first.

But now LIST the program again. More confusion! And if you need further proof that something funny is afoot, try to EDIT line 1.

So here's no-no number one: stay away from 118! Think of it as the computer's unlucky number.

The reason for this crazy behavior is that the ZX81, whenever it sees a 118, thinks that it has reached the end of a line. The number 118 is one of those "housekeeping" indicators that we talked about a few chapters ago.

And there's a further reason why we want to avoid 118's--some of our programs are going to use the presence of a 118 as an indicator of the end of the

```
10>REM DELETE 100,8,POKE16514,110
;RENUMBER,120,PREPARE,130,LOCATE
,140,GOTO,GOSUB,SEARCH,150
15 REM
20 REM
100 REM <>5?RANDY?U<>7<> TAB BR
ND<> COS Y REM <>TAB RANDY<>
TAB RAND<> FAST AT U<>TAB AN
D<>FAST LPRINT GOSUB PI777VAL <
>LPRINT<>?<>?TAN DELETE
101 REM
102 REM USE ONLY IN FAST MODE.

FIRST MARK BOUNDARIES OF MATERI
AL TO BE DELETED BY M REM > AND
N REM <. RAND USR 16514 THEN CON
SOLIDATES ALL THIS MATERIAL INTO
ONE LINE, WHICH CAN BE DELETED
IN THE USUAL MANNER.
105 REM
110 REM CHAR$ EERNDY?U774 UNPL
OT Y$?"4 PAUSE TAN ELAPTOR
111 REM
120 REM 5 RANDY?U774 UNPLOT 7
GOS Y$ SAVE 777 FAST 5 777LPR
INT ?RANDRENUMBER
121 REM
122 REM 16529 SETS THE INTERVA
L BETWEEN LINES; 16515 SETS THE
NO. OF THE SECOND LINE. NEEDS
"DUMMY" LINE 1
125 REM
130 REM GOSUB ?RANDY?U5,RND774
UNPLOT 77 FAST 77 FOR GOSUB PI L
PRINT 3 LET ?TANRENUMBER
131 REM
132 REM SET CURSOR AT FIRST LI
NE TO BE DELETED. RAND USR 16514
THEN EXPUNGES THAT LINE AND ALL
SUBSEQUENT ONES
133 REM
140 REM E,RND FOR 5?RANDY?U774 R
AND 77COS 774 PAUSE 7774 GOSUB F
AST AT TANLOCATE
141 REM
142 REM PRINT (NOT RAND) USR 16
514 LOCATES THE MEMORY ADDRESS O
F THE LINE AT WHICH THE CURSOR I
S SET. THIS COULD ALSO BE USED T
O RENUMBER
143 REM
150 REM EERNDY GOTO 77C>U77C: RE
TURN ?U774 LIST 77COS 7777 CONT 6
RANDTAN RANDGOTO,GOSUB,SEARCH
151 REM
152 REM TO PREPARE, POKE16545,1
61; AND POKE 16546,64
153 REM PRINT USR 16514 IDENTIF
IES FIRST LINE HOLDING GOTO OR G
OSUB. REPEATING PROCESS IDENTIFI
ES NEXT SUCH LINE, ETC. (USE A
LOOP TO KEEP REPEATING.)
```

FIG. 7-1 STACKING THE ROUTINES

line, just as the computer does. And those programs would be just as confused by a spurious 118 as the computer's display was.

It shouldn't be too hard to avoid 118's. After all, there are only two reasons you'd ever want to use 118--or any other number--in a computer program: as an instruction or as data. And you'll never want to use 118 as an instruction. Let me phrase that a little more emphatically--NEVER use 118 as an instruction.

And why not? If you'll look up 118 (or 76h) in the table of instructions for the Z80 chip, you'll find that it results in HALT. A very useful command, you might think--after all, BASIC programs use STOP every day. The difference is that you can always give a new command after a STOP in BASIC, to get things going again. But if you use HALT during a machine code operation, there's no way to get the computer's attention to resume operations. (The TS1000 uses the HALT instruction as an aid in creating the display file and setting interrupts. An example is given in SWN 2/2 pg. 17. The byte after the HALT tells the computers where to go.) So, you won't want to use 118 as a command very often. About once in a lifetime would be enough. But what if you want to use it as data?

Usually, the easiest way to avoid using 118 as data is to load the appropriate register with 117 and then add 1 to it. That's the approach I usually use. There's even a special instruction, called INCREMENT, that increases the contents of a selected register by 1. Or you may choose to use some other dodge. But it's usually worth while to find some way around the 118's of computer life.

There's another number, 126 (7Eh), that it's best to avoid, too. To see it at work, use the loader program to enter the following series into 1 REM:

6.0.14.125.201.

Now LIST, and look at the first line. All in order? And notice that PRINT USR 16514 gives 125, just as you'd expect. Now change the 125 to 126, and try again. The proofread is as you'd expect, and PRINT

USR 16514 gives the predicted value of 126, but look at what line 1 gives when you LIST it!

What happened to those missing bytes? Well, that's another of ZX81's little quirks. The symbol 126 is used by the ZX81 to tell itself that the next few bytes are to be construed as making up a number, and are not to be displayed in the normal fashion. To add injury to insult, if you try PRINT USR 16514 after EDITING this line, you're likely to crash the program.

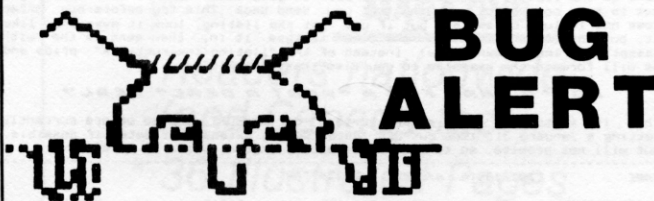
"Crash", in case you don't know by now, is a rather picturesque term for what happens when the program goes completely out of control, and can't be recaptured. You've already seen what happens when you fool around with one of the "housekeeping" bytes. Another sure way to crash is to use 118 as an instruction, as we discussed above. Yet another is to write a machine code sequence without a RETURN.

Luckily, it's the program that crashes, rather than the computer. The ZX81's hardware is not damaged at all by a crash, other than the wear and tear on the plug as you pull it out to start over. But a crash can do incalculable damage to your equanimity--and it could put a strain on your marriage, if your spouse happens to be within earshot.

Getting back to our friend, 126. It's usually easy enough to avoid using it as data. Unfortunately, however, it represents a very useful instruction. There are ways, however, to get around that instruction, and I'd suggest that you take advantage of them.

One other sometime no-no is number 11. The CHR\$ of 11 is "", the simple quotation mark. As long as you're working with REM statements, as we will be for some time, this little guy is harmless. But if you're storing your machine code in a string, as someday it may happen, he's likely to give you trouble.

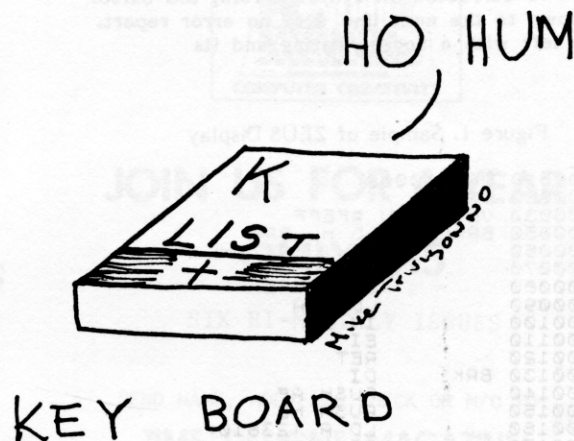
And on that ominous note, I'll leave you for now. There will be more.



Oh, dear. Your Technical Director blew it again. My suggestion for using the "Audio Frequency Counter" SMPL routine (SWN 3:1) as a tape-signal sensor assumed that the count is returned in BC, which it is not. (I was thinking of the similar VOTEM m/c routine, which does return the count in BC). It WILL work, however, if you first transfer HL into BC; one possible way is to:

```
CALL SMPL
PUSH HL
POP BC
RET
```

-fn



HOT Z/ZEUS COMPARISON

S. J. Wyatt
P.O.B. 6239
Washington, D.C. 20015
301/927-5212

Whether you are a beginner or an old pro at programming in machine language, you need the "tools of the trade" to allow yourself to concentrate on the programming and not spend 90% of your time figuring out the mechanics of getting your code into your computer. This article will describe and compare two well known assemblers and their differing approaches for programming machine code.

An assembler lets you use the (relatively) easy to understand mnemonics, such as "LD A,80" (load register A with 80), instead of the abstract "3E80" when you are typing in program listings or writing your own program. Combined with a good tutorial, such as Toni Baker's articles in ZX-COMPUTING, one of these assemblers could be just the ticket to see you well on your way into the world of machine code.

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ZEUS is a two-pass assembler which occupies memory from 57344 to 65279. It allows you to enter a program in assembly language complete with labels, comments and text. Line numbers are required, but the assembler will handle that for you automatically if you type "I" followed by the starting line and desired spacing. You must specify the Origin (ORG). The origin is where you want the machine code which ZEUS will generate from your source listing to begin. Once you've entered your program you can have ZEUS assemble it into machine code by hitting A and ENTER. If you've made an error in syntax, then assembly time is when it shows up. The assembler will stop assembling and display an error code and the line number in which it occurred. You can list the line and correct the mistake by using the cursor keys and screen editor commands.

Once you've corrected all syntax errors, the cursor moves down to the next line with no error report. You are left with a Source listing and its

equivalent in machine code, beginning at the address specified at the start of your source code by the ORG statement. The machine code program could now be run, but of course you'll want to SAVE it first. It is very important to save the source file that you spent the time to type in and not necessarily the machine code itself. With the source on tape, you can reload and examine the program, make changes and reassemble it with ZEUS in a matter of seconds. Once you are completely satisfied with the code generated from your source file, the machine code can be saved and used. The source file cannot be recreated from the machine code so keep the source code somewhere safe.

Another feature of an assembler that is not immediately apparent to the novice programmer is its ability, by changing the ORG address, to move a machine code program to a new location without the hassle of going through the machine code and changing all of the JUMPS and CALLS by hand.

The standard directives, such as, DISP for displacement of a program and EQU to assign values to labels, are also included in ZEUS. DISP is useful when you cannot assemble the program where you would ultimately run it from. For example, if you set ORG at 32768 and Disp at 10000, the machine code generated from your source file would be able to run from 32768, but it would be placed at 42768. If you didn't displace it, the code would overwrite the source file which ZEUS holds at 32768. EQU allows you assign a value to a name or label. Just suppose

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BEAT-THE-SYSTEM	94	97	Player against computer in this one. Guess the random number selected by computer. Very challenging. Not as easy as it sounds. Specify 1000/1500 (16K), or 2068.

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Figure 1. Sample of ZEUS Display

```

00010 ORG 40000
00020 ENT
00030 VECT EQU #FEFF
00050 BRKON LD HL,BRK
00060 LD (VECT),HL
00070 DI
00080 LD A,#FE
00090 LD I,A
00100 IM 2,A
00110 EI
00120 RET
00130 BRK DI
00140 PUSH AF
00150 PUSH HL
00160 LD A,(23610)
00170 CP #14
00180 JR Z,GO
00190 LD HL,23692
00200 SET 7,(HL)
00210 POP HL
00220 POP AF
00230 EI
00240 JP #0038
00250 GO POP HL
00260 LD HL,9000
    
```


you wish to use a routine in the ROM to scan the keyboard for you. You would enter "KSCAN EQU 02B0." Every time you want to use the scan keys routine, you could use CALL KSCAN instead of CALL 02B0, which is much harder to remember.

The Monitor included with ZEUS ASSEMBLER is minimal at best. Typing M/ENTER, while in the assembler, will place you into the monitor mode. From here you can change colors, get the hex or decimal equivalent, examine or output to an I/O port, copy a block of memory, set tab stops for ZEUS, modify contents of memory, or examine blocks of memory.

Nobody likes to sit and stare at lines of hex numbers. It's only a necessity when you don't have a disassembler to translate for you. The most likely uses that the average novice would get from this monitor are the set tabs and the HEX/DEC conversion functions.

The Manual is 22 pages long and only gives one example to use. Ten routines that you might find useful to call from ZEUS are listed in the appendix.

SINWARE
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HOT Z has been available in many versions since it was first introduced for the ZX-81/TS-1000. The most recent, known as HOT Z AROS, is in EPROMs mounted on John Olliger's cartridge board. They take up 24k of memory from 8000h to DFFFh in the dock and is invisible to the home bank (RAM). Virtually none of your memory is taken up by this system. HOT-Z on

cassette includes a high and low memory version, with and without a name file. The name file contains the labels of the ROM routines and the system variables as well as routines in HOT-Z itself. This is extremely helpful in understanding exactly what's happening in the machine code.

Upon loading, HOT-Z self starts and you find yourself in the disassembly, or READ mode. There are 4 modes: READ, WRITE, HEX-EDIT and SINGLE-STEP. The first three share the same screen format, the difference being in the position of the cursor and the effect of the commands.

The display is divided up into four columns. First is the address, in hex, of what follows in that row. The second column is the numbers for the instruction, also in hexadecimal, in that memory location. The fourth, the one you would read, contains the Z-80 assembly language mnemonics for the instruction. The third column is reserved for labels. Each label corresponds to an address. You can label your own routines or those of others. Since these names are restricted to four characters, some forethought is required in order to reflect the purpose of the routines.

In READ, the cursor appears at the top of the screen in the address column. To examine the next "page" of disassembly, merely hit the space bar. To go to a specific point in memory, you can type in the address or label.

If you wish to write machine code, you can enter HEX-EDIT (symbol-shift/E) or WRITE (symbol-shift/A). Quite often the machine code listings in magazines are in hex. They are difficult to understand and impossible to debug until you save the resulting code and examine it with a disassembler. In HOT-Z,

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however, the hex is converted to its mnemonics as you type it in, and hitting ENTER isn't required. If you wish to enter a listing in mnemonics, such as the source listings in magazines, enter the WRITE mode and begin typing it in, hitting enter after each instruction. The hex equivalent will appear in the second column as HOT-Z assembles it. This is a line assembler in that the machine code is assembled line by line as you enter it in either form. Syntax errors prevent the line being accepted (as in Sinclair Basic), so any corrections are made as you go along. There is no source file as there is in ZEUS.

Figure 2. Sample of HOT-Z Single Stepper Display

REG	HEX	CODE	CHR\$
0000	0000	0000	0000
0001	0000	0000	0000
0002	0000	0000	0000
0003	0000	0000	0000
0004	0000	0000	0000
0005	0000	0000	0000
0006	0000	0000	0000
0007	0000	0000	0000
0008	0000	0000	0000
0009	0000	0000	0000
000A	0000	0000	0000
000B	0000	0000	0000
000C	0000	0000	0000
000D	0000	0000	0000
000E	0000	0000	0000
000F	0000	0000	0000
0010	0000	0000	0000
0011	0000	0000	0000
0012	0000	0000	0000
0013	0000	0000	0000
0014	0000	0000	0000
0015	0000	0000	0000
0016	0000	0000	0000
0017	0000	0000	0000
0018	0000	0000	0000
0019	0000	0000	0000
001A	0000	0000	0000
001B	0000	0000	0000
001C	0000	0000	0000
001D	0000	0000	0000
001E	0000	0000	0000
001F	0000	0000	0000
0020	0000	0000	0000
0021	0000	0000	0000
0022	0000	0000	0000
0023	0000	0000	0000
0024	0000	0000	0000
0025	0000	0000	0000
0026	0000	0000	0000
0027	0000	0000	0000

Once your program is entered, you can save it and run it from WRITE mode. This brings us to one of the most powerful features of HOT-Z, the SINGLE-STEPPER (figure 2). As the name implies, this mode allows you to step through a routine one step at a time and examine the results. All of the accessible registers are shown, including the alternates, along with their contents. Below these are the stack pointer, pseudo stack and the condition of the flags and exchange flags. Finally, at the bottom of the screen are the last instruction executed, the next to be executed, and the three in sequence after that. When you hit ENTER, the next instruction is run and every thing on the screen is updated. If you wish, you can set 2 breakpoints and have HOT-Z until it reaches one.

A window facility is also included. This allows you to set aside a portion of free memory for a second display which can alternate with the single step

Figure 3. Sample of HOT-Z Disassembly Display

ADDR	HEX	CODE	LABEL	MNEMONIC
0000	0000	0000		DT
0001	0000	0000		XOR A
0002	11FFFF	0000		LD DE,FFFF
0003	0000	0000		LD init
0004	0000	0000		LD HL,(chad)
0005	0000	0000		LD (xptr),HL
0006	0000	0000		LD (xptr),HL
0007	0000	0000		LD (xptr),HL
0008	0000	0000		LD (xptr),HL
0009	0000	0000		LD (xptr),HL
000A	0000	0000		LD (xptr),HL
000B	0000	0000		LD (xptr),HL
000C	0000	0000		LD (xptr),HL
000D	0000	0000		LD (xptr),HL
000E	0000	0000		LD (xptr),HL
000F	0000	0000		LD (xptr),HL
0010	0000	0000		LD (xptr),HL
0011	0000	0000		LD (xptr),HL
0012	0000	0000		LD (xptr),HL
0013	0000	0000		LD (xptr),HL
0014	0000	0000		LD (xptr),HL
0015	0000	0000		LD (xptr),HL
0016	0000	0000		LD (xptr),HL
0017	0000	0000		LD (xptr),HL
0018	0000	0000		LD (xptr),HL
0019	0000	0000		LD (xptr),HL
001A	0000	0000		LD (xptr),HL
001B	0000	0000		LD (xptr),HL
001C	0000	0000		LD (xptr),HL
001D	0000	0000		LD (xptr),HL
001E	0000	0000		LD (xptr),HL
001F	0000	0000		LD (xptr),HL
0020	0000	0000		LD (xptr),HL
0021	0000	0000		LD (xptr),HL
0022	0000	0000		LD (xptr),HL
0023	0000	0000		LD (xptr),HL
0024	0000	0000		LD (xptr),HL
0025	0000	0000		LD (xptr),HL
0026	0000	0000		LD (xptr),HL
0027	0000	0000		LD (xptr),HL

display to let you observe the effects of your program on screen. As a debugging tool, this is hard to beat.

Conclusion

ZEUS is a competent assembler but with a limited debugging capability and with no disassembler. This means you can't load up a program and examine it in its disassembled form. It's possible to enter a program in hex by using the monitor facility, but you won't see it disassembled. Other than syntax errors, debugging is a matter of "try it and see." The greatest feature, as compared with HOT-Z, is the source file. As I mentioned before, all that has to be done to alter the position from which your program is run is to change the ORG value and, of course, any absolutes that refer to the program itself.

HOT-Z, on the other hand, is a combination of a monitor, editor, disassembler and assembler with very extensive debugging facilities. There are so many features included that it is impossible to give a complete picture let alone describe the uses of all of them. I haven't even touched on the floating point interpreter or the relocation features. HOT-Z even lets you load in ZX-81/TS1000 tapes. The only serious drawback to HOT-Z is the absence of a source code. However, with the many code and block manipulation commands, it's by no means a fatal omission.

Ideally, you would have both ZEUS and HOT-Z in your tool box. The combination of ZEUS' source file and HOT-Z's editing and debugging capabilities would be perfect. If it comes to "one or the other" though, HOT-Z, while a little more expensive, offers advantages that far outweigh the lack of source file and extra few dollars.

DICE 1000

Chuck Peterson
PO Box 98
Alcester, SD 57001

Although it is an old standby--a rolling pair of dice, this version's merits are speed and flexibility.

"Dice" begins with a few lines to draw the dice. This is followed by the basic (with machine code) to roll them. Lines 220 and 230 set the screen location for the pips of the first die. Lines 330 and 340 do the same for the second die. The two pairs of POKES enter a displacement number which is added to the address of the screen by the machine code. I have included the routine at line 500 to calculate the displacement (since this is easier than trying to explain it). RUN 500. You will then be prompted for the row and column values where you would like to place the upper left hand pip of each die. You may then edit them into the program in the lines that POKE 16544 & 16545.

Line 260 determines which character will be printed as the pip. It is currently the "O" character. Line 300 changes the character that is printed (grey graphic) on the last roll of the dice and may be deleted if desired. Line 270 determines how many times the dice will be rolled, which is currently a number from 3 to 5. Line 290 picks a number from 1 to 6 and pokes it into the machine code. This will be the number of pips that are printed.

There is a delay in the machine code at address 16561. It is currently set at 5, but you may want to try a number between 0 to 10. For a quick experiment, try editing line 260 and make it an inverse space, POKE 16561,1 and then RUN the program.

The machine code can be relocated if you calculate new addresses for the POKES and the USR call. Assume "start" is where the machine code begins.

LINE	ROUTINE	OFFSET
310	Call address	start +6
230 & 330	Pip location	start +30
240 & 340	Pip location	start +31
Direct POKE	Delay	start +47
290	# of pips printed	start +70
260 & 300	Character printed	start +90

To enter the machine code, you will need a REM line with 103 spaces after the REM or 103 bytes of space in memory elsewhere. Enter the following decimal table with your favorite POKER program or use the HOT Z listing of the machine code to hex poke the data.

Enter the data left to right, top to bottom.

DECIMAL TABLE

119	107	099	042	065	008	205	032
021	175	006	002	087	030	006	213
030	093	213	030	003	213	213	030
093	213	030	006	213	017	127	001
213	016	233	006	007	042	012	064
209	025	119	016	251	001	001	005
011	120	177	032	251	205	167	014
197	042	012	064	043	034	022	064
052	064	205	086	015	052	006	205
029	021	239	004	036	052	205	167
014	003	225	237	066	078	006	007
052	008	042	012	064	209	025	203
025	048	001	119	016	247	201	

BASIC PROGRAM LISTING

```

1 REM ???EINKEY$LN 4+??2$5
TR$ 27STR$ 2 STR$ STR$ 27STR$ 2
STR$ ) STR$ ( DIM $E$RND$GN ?
( CLS $ "??4 CLS LN $ VAL $RND
F6-RNDYRNDLN ??Y LN 1+ LOAD $0L
N $ LPRINT GOSUB PI?Y$E$RND$
GN ACS K? ( RUN TAN
10 REM
20 REM * DICE *
30 REM CHUCK PETERSON
40 REM APRIL, 1985
50 REM
60 REM 16520: ENTER ROUTINE
70 REM 16544/45: OFFSET
80 REM 16561: DELAY
90 REM 16603: PIP CHAR. CODE
95 REM
100 REM OUTLINE DICE
105 PRINT " PRESS ANY KEY TO RO
LL THE DICE"
110 LET R=4
120 LET C=3
130 FOR F=1 TO 2
140 PRINT AT R,C;" "
150 FOR G=1 TO 9
160 PRINT TAB C;" "
170 NEXT G
180 PRINT TAB C;" "
190 LET R=9
200 LET C=17
210 NEXT F
220 REM ROLL
230 POKE 16544,204
240 POKE 16545,0
250 FOR F=1 TO 2
260 POKE 16603,CODE "0"
270 LET A=INT (RND*4)+4
280 FOR G=1 TO A
300 IF G=A THEN POKE 16603,CODE
"0"
310 LET Z=USR 16520
320 NEXT G
330 POKE 16544,127
340 POKE 16545,1
350 NEXT F
360 RAND

```

```

370 GOTO 370-(140 AND INKEY$<>")
380 REM END ROLL
390 REM
500 REM FIND OFFSET
510 PRINT "OFFSET POKES",,,,
530 PRINT "ROW NUMBER (0 THRU 1
7)?"
540 INPUT R
550 PRINT TAB 28;R,,,
560 PRINT "COLUMN NUMBER (0 THRU
U 25)?"
570 INPUT C
580 PRINT TAB 28;C,,,
590 LET OFFSET=R*33+C+1
600 LET X=INT (OFFSET/256)
610 LET Y=OFFSET-256*X
620 PRINT "POKE 16544,";Y,,,
640 PRINT "POKE 16545,";X
650 STOP
660 REM END FIND OFFSET
670 REM
1000 REM SAVE
1010 SAVE "DICE"
1020 RUN

```

MACHINE CODE LISTING

```

4082 77 DATA LD (HL),A
4083 68 Z654 LD L,E
4084 63 LD H,E
4085 2A4108 Z321 LD HL,(0841)
4088 CD2015 INIT CALL STBC
408B AF XOR A
408C 0602 LD B,02
408E 57 LUP1 LD D,A
408F 1E06 LD E,06
4091 D5 PUSH DE
4092 1E5D LD E,5D
4094 D5 PUSH DE
4095 1E03 LD E,03
4097 D5 PUSH DE
4098 D5 PUSH DE
4099 1E5D LD E,5D
409B D5 PUSH DE
409C 1E06 LD E,06
409E D5 PUSH DE
409F 117F01 LD DE,017F
40A2 D5 PUSH DE
40A3 10E9 DUNZ LUP1
40A5 0607 ERAS LD B,07
40A7 2A0C40 LD HL,(DFILE)
40AA D1 LUP2 POP DE
40AB 19 ADD HL,DE
40AC 77 LD (HL),A
40AD 10FB DUNZ LUP2
40AF 010105 DLAY LD BC,0501
40B2 0B LUP3 DEC BC
40B3 78 LD A,B
40B4 B1 OR C
40B5 20FB JR NZ LUP3
40B7 CDA70E CALL UNST
40BA C5 PUSH BC
40BB 2A0C40 LD HL,(DFILE)
40BE 2B DEC HL
40BF 221640 LD (CHADD),HL
40C2 3E40 LD A,40
40C4 CD560F RAND CALL SCAN
40C7 3E06 LD A,06
40C9 CD1D15 CALL STKA
40CC EF RST 28H
40CD 04 MULT
40CE 24 INT
40CF 34 END
40D0 CDA70E PTRN CALL UNST
40D3 03 INC BC
40D4 E1 POP HL
40D5 ED42 SBC HL,BC
40D7 4E LD C,(HL)
40D8 0607 PRNT LD B,07
40DA 3E08 LD A,08
40DC 2A0C40 LD HL,(DFILE)
40DF D1 LUP4 POP DE
40E0 19 ADD HL,DE
40E1 0B19 RR C
40E3 3001 JR NC 40E6
40E5 77 LD (HL),A
40E6 10F7 DUNZ LUP4
40E8 C9 RET

```

Robert D. Hartung
Box 148, Huntertown, IN 46748

The POINT function allows us to do this. We also need a single-dot UDG character in the very corner of an 8 X 8 matrix so we define this as CHR\$ 01h (hex notation). Now, let's single-step through the following demo routine written for the 8510AP and using Tom's printer driver:

For a screen-dump COPY routine that will work with any printer driver and either dot-matrix or formed-type printers, the following listing may be used. Line 5 is set up using the C. Itoh 8510AP control codes for proportional pitch and a 3/14" line-feed. These should be revised for your printer to set the character-pitch to proportional or the maximum number of characters-per-inch and a very small line-feed increment.

Line 10 gives the vertical scan and Line 20 FOR y=0 TO 255 will give a full-width horizontal scan of the display (actually of DFILE1). However, unless your printer adjusts to very small spaces between printed period (.) characters in proportional mode it may be necessary to limit the scan to something like FOR y=0 TO 182 to prevent overprinting. LOAD your printer driver software and enter CLS: LIST: GO TO 5 to get a screen-dump COPY of the listing itself.

```

2 PRINT "12345678901234567890
123456789012": REM Full-width
3 PLOT 50,120: CIRCLE 50,120,
50: REM Linearity test
5 LPRINT CHR$ 27; CHR$ 80; CH
R$ 27; CHR$ 84; CHR$ 48; CHR$ 51
10 FOR x=175 TO 0 STEP-1
20 FOR y=0 TO 182
30 IF POINT (y,x) THEN LPRINT
";
40 IF NOT POINT (y,x) THEN LPR
INT " ";
50 IF y=0 THEN LPRINT
60 NEXT y
70 NEXT x

```

TS1500 IS MORE THAN MEETS THE EYE

We've all (well, almost all) used and loved the ZX81 and TS1000, and many of us have become enthralled with the TS2068. Yet there is another Timex/Sinclair, the TS1500, which somehow "fell through the cracks," as it were, and is only occasionally even mentioned, even within these pages. If anything, the only thing we've heard were reports about bugs in the ROM, some rumours about "bank-switching ability," and reports about SOME units not working with SOME software or add-ons.

The TS1500 is just a fancy ZX81, right? WRONG! Recent discoveries by Greg Harder (1st-prize winner of the TS1000 category in our screen contest) demonstrate that the 1500 is capable of FAR SUPERIOR "software-only hi-res" than ever was seen on a ZX81! All but the highest bit can be EXACTLY CONTROLLED! For low- to medium-density plots, the results are most impressive. Oddly enough, this only works if:

- 1) the 8-16K region is fully decoded, as with a Hunter board or 64K pack, OR 2) if the ROM is replaced with a TS1000 ROM. (!!) To see if it will work with your particular unit, enter Mr. Harder's little "te

```

1
10
20
30
40
50 POKE L+3,71
60 POKE L+4,201
100 FOR N=0 TO 32
110 POKE L+1,N
120 RAND USR L
130 NEXT N
140 FOR N=0 TO 255
150 PRINT CHR$ N;
160 NEXT N
170 FOR N=0 TO 100
180 NEXT N
190 POKE L+1, 30
200 RAND USR L

```

"The machine-code in the REM line is:

```

LD A,n
LD I,A
RET

```

"For values of I from 0 to 29 the screen fills with garbage as the computer reads the space character pattern at different ROM addresses [just as on the ZX81/TS1000]. For values 30 and 31 the normal pattern is addressed.

"However, if I is set to 32, then something strange happens, and the pattern printed to the screen consists of:

A) Chr. codes 0-63, a direct binary equivalent is printed.

B) Chr. codes 128-191, a complimented pattern is printed.

"This means that 128 binary patterns are directly available, from 0000 0000 through 0111 1111. Binary patterns with bit 7 set are not available, as the complimented form is automatically sent, and patterns with bit 6 set (64-127 and 192-255) are output as the "binary equivalent" of the token characters." -G.C. Harder

Greg is presently working on a comprehensive hi-res package using this discovery, and yours truly is threatening a TRUE 64-column utility. If you try this with a TS1000, you'll only get a black screen.

Internal circuitry is also far superior to the ZX81/TS1000, employing LS244 and LS245 bidirectional buffers instead of resistor strings. Could this be part of the "secret?" Tom Bent reports that the TS1500 SCLD has THREE UNUSED PINS (chip selects? bank switching?). Answers to these and other questions hinge on the following: is there a TS1500 tech manual? As far as we can gather, the answer is "NO." Yet there is the occasional bit of corporate (Timex) technical memos which suggest that one was perhaps under construction. Are there any ex-Timex engineers out there reading this column? If so, let yourself be known! -fn

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